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## CONTRIBUTION TO THE LIFE-HISTORY OF THE CALIFORNIA MASTIFF BAT

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[Plates 5-6]

Among the bats found within our borders, there is probably none more interesting than our largest species—the California mastiff bat (*Eumops californicus*). First discovered at Alhambra, California, by E. C. Thurber, it has always been considered decidedly rare, and is poorly represented in even our largest museums.

During the past year, I have had exceptional opportunities to study this form, and now after a great deal of hunting, which cannot better be described than by the word “snooping,” poking my nose into every likely and unlikely place, and even advertising, I have no hesitancy in pronouncing it a common species in the orange section or thermal belt of Los Angeles County. However, to be successful in finding it, one must employ no little energy and perseverance. Almost all of my observations were made in the company of L. Little, and with his assistance.

I imagine that in the days before houses were built in this section, “mastiffs” were in the habit of roosting in cracks of occasional cliffs. Undoubtedly, they sometimes used hollow trees as well, but not to a great extent, for trees with cavities high enough to suit them were anything but plentiful. At present, they may be found in a variety of situations, such as attics, large warehouses, or cracks in high masonry, but the colonies are not nearly as populous as are those of most other bats. I consider that twenty is rather a large number for a colony, although as many as seventy may be found together. I have heard

rumors, which may or may not be so, of roosts of this species having been found but a few feet above the ground, and it is undeniably true that many single animals have been secured while hanging at a low elevation, but all five locations from which I have secured them, besides a roost "belonging" to L. E. Wyman, have been so situated that the bats had an uninterrupted drop of at least twenty feet before taking wing. I am so sure of the necessity of this point that I would not think of searching for them where this condition did not obtain. In the aggregate, I have spent hours studying dozens of individuals in my screened porch and trying to make them fly, but whether in January or during the heat of June, they all refused even to flutter their wings when dropped from as high as I could reach while standing upon a chair, although they were exceedingly lively and scrambled about the floor with the greatest celerity. I have even, at different times, caught thirty individuals which Little dropped to me from at least thirty feet above, and although they spread their wings so as to break their falls, not one tried to fly; and this on sunny and fairly warm days. Last spring, one entered the open window of a vacant room, alighted on a lace curtain and finally died—evidently because it could not leave with so little "take-off." I found one dead beneath the eaves of my cow shed, and another on the floor of a low building. I discovered about eighteen which had died in an attic because the ventilator at that end of the gable had been plugged, and they could not or would not fly the few feet to the other end of the building where there was a good exit. On the other hand, L. E. Wyman has succeeded in making several fly in his screened porch, although it was earlier in the season and presumably cooler than when I have tried the same experiment. The probable explanation of this is that unusually active individuals, or those which for some reason are in an unusually active condition, can take wing from low situations, but that the majority, especially during the cooler parts of the year, need to gain momentum by taking a long dive, before flying.

Somehow, *Eumops* has an exotic appearance, as if it were an accidental visitant to our fauna rather than an established resident. The genus is a tropical one, and our species seems rather hard put to it to survive. In large colonies of other bats, one rarely finds a dead individual. I have not only found dead mastiffs in every colony visited, but three others in haphazard spots as mentioned, and have heard of still more. One really would be justified in pronouncing it a case of the gradual elimination of the unfit if it were not for the fact that both available shelter and food, because of agriculture and irrigation, are much more abundant than they could have been in the past.

My first mastiff was secured October 23 from the ridgepole of a large, abandoned packing house a mile from my home near Covina, Los Angeles County, and was in such a position that we had to shoot it. This is not a regular roost, for there are few or no dark nooks for hiding, but its vicinity is a favorite hunting ground for several species of bats, and the mastiffs occasionally use it for a day or two at a time, for I found another there later in the winter.

The next find was near Colton, San Bernardino County, and was located through W. C. Hanna, to whose kindness we are especially indebted. It was situated in a crack between an outside timber and the wall of an old stone building, with a sheer drop below it of about thirty feet. On this building there were other similar situations, but there was a little old guano beneath only one other crack. This roost contained at least forty, and possibly sixty bats. Little, Hanna and I visited this on November 5, when eighteen were secured, equally divided between the sexes. Another visit was made to this colony November 24 and twelve more captured, but we could tell nothing in regard to the number remaining, except that there were quite a few crowded into a dark corner. On April 23 there were no bats there. I do not believe that our activities drove them away, for I have taken every bat from a colony and found more later. Rather do I think that they temporarily sought some other location for breeding, or that it was used as a winter roost only. However that may be, a less suitable spot for wintering it would be difficult to find. The stone which bounded one side of the cranny was very cold, of course, and in addition, the aperture of the space occupied was fully as large above as below, with nothing to shelter the inmates when the cold, driving rain of the winter storms beat upon them. Still, there were the desiccated remains of but two, and that is an unusually low mortality.

Another small colony was discovered March 20 in a large house within a short distance of my ranch. Previously, the bats had occupied the attic, but their noise was such a nuisance that the ventilators were covered with netting and the twenty or thirty bats thus imprisoned were caught and killed. At the time of my visit, I found two live bats between the slats of one ventilator, and in another, four, one dead and blown with small maggots, another dead only a few hours, and two others which were decidedly weak. This was at the end of a spell of cold, rainy weather, but I cannot see why these should die of cold and hunger while those secured on the eighteenth were fat and lively. A possible explanation is that the latter were in a protected situation,

while the ones in the ventilators were continually subjected to a cold draught, which may have rendered them torpid throughout a protracted period. When I secured these individuals, I surreptitiously pried loose a corner of the screening, and what was my delight, upon visiting the attic December 5, 1919, to find about seventy mastiffs in the gable. They were hung to the shingle studs beneath the sloping roof, a short row to a stud, and thus overlapping as if they were animated shingles—truly a sight to delight the heart of a mammalogist. I took a few of these and found that they were of both sexes, as usual.

A colony was located in a small, two story house near my place on April 15, the bats gaining entrance through a slatted ventilator at the end of the attic. It was a very old roost and the guano was thick beneath it. There were seven mummified bodies upon the floor, I captured thirteen live ones, and there were at least eight or ten more in some cracks, but they were very lively, keeping up a great racket while scrambling about their retreat, and braced themselves so securely that it required much persevering manipulation with the long forceps to secure them.

On March 18 we discovered a colony of thirteen mastiffs in the attic of a two story building near Azusa, Los Angeles County. From this we took ten. I visited this again on May 31 and took two females, but left a single male. At the other end of this attic was a colony of *Nyctinomus* and *Eptesicus*. When Little visited this spot in late December there were no bats present.

This species, like its near relative *Nyctinomus*, has a very penetrating odor—decidedly more so than that of most bats—and this will cling for months to a sack in which the animals have been carried. I have always found both sexes together, even just before young were to be expected, and the females outnumber the males by about two to one. The average measurements in millimeters, taken by myself, of ten males and twenty-two females, are, respectively for the sexes—length, 175 and 174; tail, 60.7 and 57; expanse, 540.7 and 526.

The gland on the lower throat with its external opening is easily overlooked when inactive, and indeed I have been able to find no mention of it in publications. Ordinarily, it appears externally as a tiny dent, and internally, the skin is here attached to the body by a sort of tendon. When the males are most active sexually, the gland swells, is then shaped like a small-holed doughnut of a grayish, cheesy formation, and measures 14 mm. in diameter by 4 in depth. This makes a corresponding swelling externally and the opening is much enlarged,

the surrounding hairs being moistened by the exudation of a slimy matter with a very strong odor. The glands were active in most of the males secured March 28, and in but one of those taken December 5. By the middle of April the glands have greatly subsided. As far as I am aware, all of the European bats which have been dissected and examined in this connection, have been found to breed in the fall, or at least some time during early winter. The incipient ovule then remains in a quiescent state in a manner and by a means on which it is not necessary here to dwell at great length. The embryo does not reach its place of development nor start to form until warmer weather and the consequent increase of chiroptine activity stimulate it to grow, and this beginning can be retarded for several weeks by keeping the prospective mother in a low temperature. There is no reason to suppose that most of our bats differ in this respect, although the phenomenon probably does not obtain with tropical bats. My experience has led me to believe that probably the rut does not begin at the same time with all males, but that its start may depend on the animal's condition or some indeterminate cause. At any rate, it has been ascertained that the rut of some English bats lasts for a comparatively long time, and fertilization probably takes place at any time during the winter that opportunity offers.

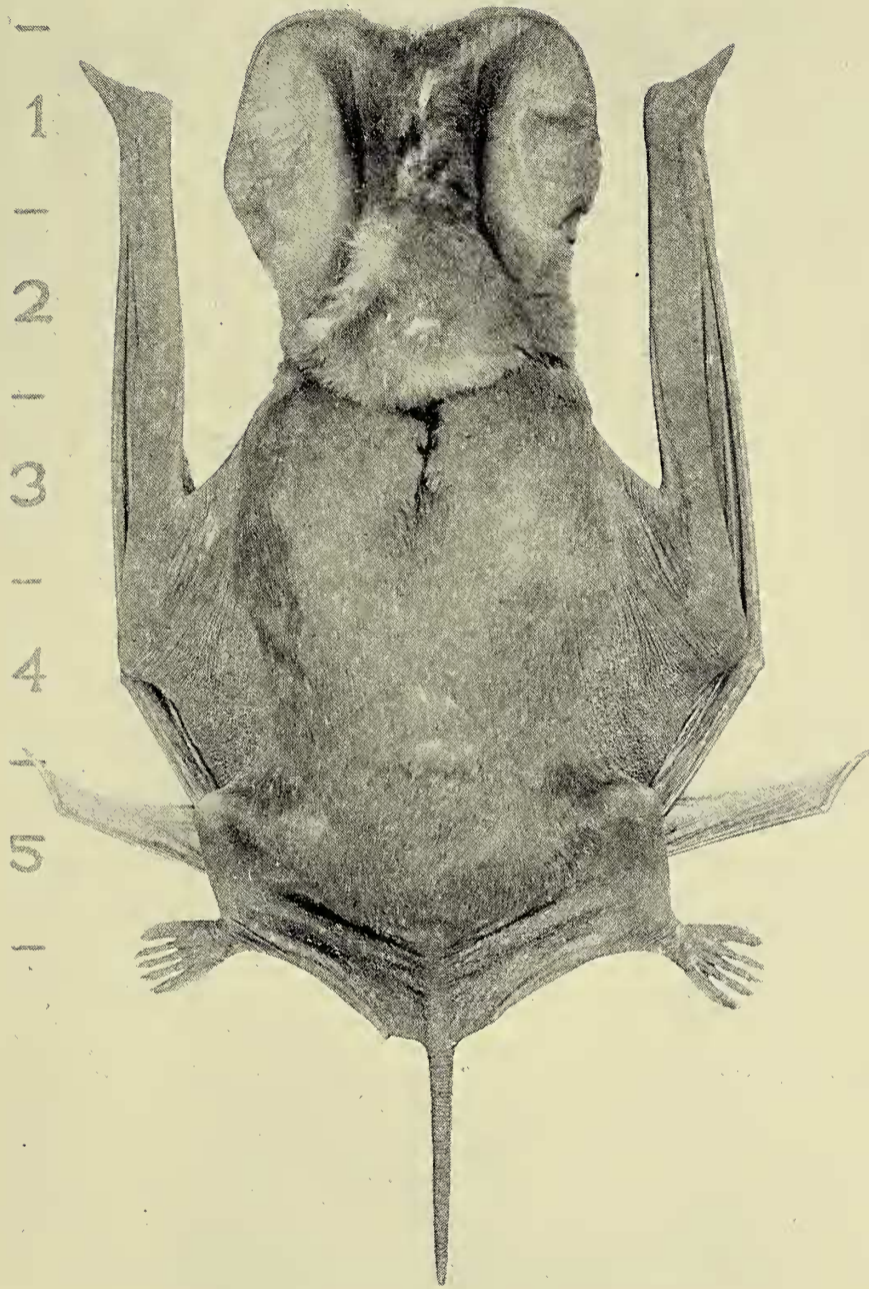
Females secured April 15 each contained a single embryo with a uniform length of three-quarters of an inch. As I was particularly anxious to examine the young and was leaving for the north the first of June, I took two females May 31 which were very heavy indeed. Had I known that it would be so long before the young appeared, I would not have disturbed them, but I had daily expectations while they were in captivity, and as they seemed to be perfectly healthy and cheerful, I kept one until June 30, when a young one was born, but it had then been dead for several days and I could not save it. It was surprisingly large and dull black in color. The other female I presented to the Museum of Vertebrate Zoology and it died June 14.

These bats may either hang in a horizontal row, or crowd singly into crevices. A favorite position is hanging vertically with the whole length of the legs hooked over onto a horizontal surface above, and slightly braced by the bend of the wings. They often vibrate the body gently for minutes at a time. Normally, the ears are held in the position shown in the illustrations, but the eyes are then concealed, so upon the slightest disturbance the ears are raised until the upper surfaces almost touch each other, and the animal will shrink away as far as

possible. Although their unwillingness or inability to fly at once renders them rather easy to catch, they try hard to escape by crawling. They are very pugnacious and can inflict a decidedly ugly slash with their needle-sharp incisors, as I can testify. When touched, they utter a shrill, chattering scream of astonishing volume, with the mouth opened to the fullest extent. The special formation of the lower jaw enables them to open their mouths to even a greater extent than is usual among bats, and this character must in some way be connected with their food or manner of obtaining it, but upon this point I can shed no light, for the stomachs of all those examined were empty. I have never succeeded in making a captive mastiff take food, even by placing a variety of insects in its mouth, but one of the captives kept by L. E. Wyman ate disabled insects, during the night. The bat seemed afraid of bulky prey like Jerusalem crickets even when they had been rendered helpless. However, if it habitually feeds only upon small fry, then for what is that huge mouth?

*Eumops* shares with *Nyctinomus* the distinction of being among the most agile of bats while on the ground. With wing tips folded above the back so as to be out of harm's way, they scutter across the floor in a sort of gallop, while the action of their "arms" reminds one of nothing so much as an "over-hand" swimmer.

I have found that certain bats which spend the summer in the southern part of California and migrate at the approach of cold weather, can go without food for very little more than forty-eight hours without dying, and this is as might be expected. They shun the cold and there are seldom or never any storms during the summer that continue long enough to prevent them from securing at least a little food every night. However, those which spend the winter, even in our thermal belt, must be of sterner stuff. The winter storms are not precisely warm and often last for three days or more. In addition, there may be a solid week of cold weather with ice every night, and although this does not distress *Nycteris*, for instance, I do believe that it would keep *Eumops* indoors. Hence, it is necessary that the mastiffs be able to fast, and fast they can. Although not hibernating in the true sense of the word, they enter what may be called a voluntary hibernation or torpid sleep. If placed in a cool situation, even late in the spring, they become torpid, cold, and to all appearances, dead. I kept one thus from November 5 to December 13, and usually, when examining her daily, I was obliged to shift her wings into different positions before I could detect the slightest sign of life. However, no matter how cool the day, disturbance



DORSAL VIEW OF CALIFORNIA MASTIFF BAT  
(Reduced)

(Howell: The California Mastiff Bat.)